

REMARKS

Reconsideration of the above-identified application in view of the following remarks is respectfully requested. Claims 1-19 are currently pending. Claim 17 has been objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 10 and 15 have been objected to because of minor typographic informalities. Claims 1, 10, and 15 have been amended.

With respect to the prior art rejections, claims 1, 3, and 4 stand rejected under 35 U.S.C. § 102(b) as anticipated, whereas claims 1-16, 18 and 19 stand rejected under 35 U.S.C. § 103(c) as obvious. Applicant respectfully disagrees and transverse each of these rejections. For purpose of clarity, Applicant addresses each of Examiner's concerns in the order set forth in the Office Action. Finally, claims 1-16, 18, 19 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-8, 14-16, 18, 19, 21-24, 29-62, and 65 of co-pending Application No. 09/715, 830 in view of DE 19820756 and Shackelford (Mat. Sci. for Engineers 1992). A terminal disclaimer in accordance with 37 CFR § 1.321 is submitted herewith to obviate these rejections.

Claim Objections

The drawings have been objected to because there appears to have been two sets of drawings filed (*i.e.*, originally filed Figures 1-65C and new drawing sheets containing figures 1-4C purportedly filed on August 36, 2002). In reviewing Applicant's relevant patent application files, Applicant confirms that the originally filed application included 37 drawing sheets containing Figures 1-65C. Applicant has no records that indicate the filing of new drawings on August 26, 2002. To resolve this discrepancy, Applicant respectfully requests that the Examiner cancel the new drawing sheets containing Figures 1-4C from the present application. Applicant will formalize Figures 1-65C of the present application upon issuance of a Notice of Allowance.

Claim Objections

Claims 10 and 15 have been objected to because of minor typographic informalities. Applicant has made appropriate corrections to resolve these issues and respectfully request that these objections be withdrawn.

Claim Rejections under 35 U.S.C. § 102(b)

Claims 1, 3, and 4 have been rejected under 35 U.S.C. § 102(b) as being anticipated by German Patent No. DE 19820756. Importantly, the Examiner has concluded that “the workpiece” [of DE 19820756] would inherently function as a current collector for the transmission of electrical current. Applicant respectfully disagrees and traverses these grounds of rejection.

Without any further processing, the perforated silicon workpieces (*i.e.*, “support structures”) taught by DE 19820756 are not capable of functioning satisfactorily as fuel cell electrode structures. This is because the disclosed silicon workpieces are only “semi-conductive” in character and have a stated resistivity of 5 Ω cm (probably because they are intended to function primarily as “valuable optical or mechanical filters”). Indeed, the perforated and semi-conductive silicon workpieces taught by DE 19820756 (unlike the specially processed silicon electrode structures of the present invention) are not fully saturated with a selected dopant (*e.g.*, Phosphorus or Boron); thus they have a somewhat standard and relatively high resistivity value of about 5 Ω cm (*see* English language translation of DE 19820756 at page 4, line 17). As is appreciated by those skilled in the art, the stated resistivity of 5 Ω cm is far too great to enable the silicon workpieces of DE 19820756 to function satisfactorily as current collectors (and thus as electrode structures) in a fuel cell (verified by the inventors of the present invention as they tried unsuccessfully to build and operate such a silicon-based fuel cell).

Conversely, the resistivity of the specially doped (*i.e.*, post-processing doping to saturation limit) silicon electrode structures of the present invention have a disclosed resistivity of only about 0.05 Ω cm. This two orders of magnitude difference in resistivity is because the specially doped silicon electrode structures of the present invention have been saturated with a

selected dopant, namely and for example, Phosphorus (*see* Example 1 of specification at page 15, step 1.20, and at page 17, step 2.13, wherein disclosed process steps teach the diffusion doping of a porous silicon substrate to make the porous silicon sufficiently conductive by achieving a resistivity of approximately 50 m Ω cm). In short, the near fully doped silicon electrode structures of the present invention are capable of functioning satisfactorily as current conductors and thus as electrode structures (unlike the partially doped silicon workpieces taught by DE 19820756), thereby enabling the claimed electrode structures to operate satisfactorily in a fuel cell. The silicon workpieces taught by DE 19820756, on the other hand, are not capable of functioning satisfactorily as current conductors for a fuel cell.

Because the presently claimed invention recites an "electrode structure adapted for use with a fuel cell system," claims 1, 3, and 4 are not anticipated by DE 19820756. Nonetheless, and for purposes of further patentably distinguishing the presently claimed invention from DE 19820756, Applicant has amended claim 1 such that I now also recites that each of the one or more selectively doped regions has a resistivity of no greater than about 0.05 Ω cm. Accordingly, and view of the foregoing, Applicant respectfully requests that the above-identified anticipation rejections be withdrawn.

Claim Rejections under 35 U.S.C. § 103(c)

Claims 1, 12-15, 18, and 19 have been rejected under 35 U.S.C. §103(a) as obvious in view of FR 2667728 in combination with DE 19820756. Applicant respectfully disagrees and traverses these rejections.

As before, the perforated silicon workpieces taught by DE 19820756 are not capable of functioning satisfactorily as fuel cell electrode structures for the reasons set forth above. Moreover, Applicant notes that the Examiner has concluded that one of ordinary skill in the art would be motivated to use the perforated silicon workpiece of DE 19820756 as the anode and cathode catalyst support structures of FR 2667728. In this regard, the Examiner has stated:

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the

artisan would be motivated to use the perforated silicon workpiece of the German reference as the anode and cathode catalyst supporting structures of the French reference. In the abstract, the German references teach that “the incompletely perforated second regions provide the perforated workpiece with increased strength and stability in an inexpensive manner, so that the risk of braking during mounting is reduced.” Accordingly, the artisan would be motivated by this disclosure to use the workpiece of the German reference as the catalyst supporting structure in the electrodes of the French reference.

Office Action at page 4, lines 8-15.

Applicant respectfully disagrees with the Examiner’s syllogism in this regard because, among other reasons, (1) the presently claimed invention is in all embodiments directed to unique “electrode structures” (not electrode assemblies or fuel cell systems) and the Examiner’s alleged motivation relates only to a combined fuel cell system (not individual electrode structures); and (2) the Examiner’s proposed modification would necessarily render the fuel cell of FR 2667728 inoperable and thus unsatisfactory for its intended purposes.

With respect to the Examiner’s alleged motivation, Applicant notes that the stated rationale behind the standing obviousness rejections is “because the artisan would be motivated to use the silicon substrate of the German reference as the anode and cathode supporting structures of the French reference” (*See* Office action at page 4, lines 9-11, *emphasis added*). Because the presently claimed invention is in all embodiments directed to unique “electrode structures” (and not electrode assemblies or fuel cell systems), the Examiner’s rationale has no applicability. Put simply, there is no teaching or suggestion in either of the two cited references to make any of the electrode structures presently claimed.

With respect to the Examiner’s proposed modification, FR 2667728 is directed to a gaseous hydrogen-oxygen type (*i.e.*, not a direct liquid feed type) of fuel cell that comprises two porous conducting electrodes separated by a liquid electrolyte filled porous polymeric matrix. Importantly, the porous electrodes taught by FR 2667728 are disclosed as being “chosen from among porous carbons, metal carbides,” and also “gold metallic foam” (*see* English language translation of FR 2667728 at page 4, last paragraph, and Examples 1-6). In all

instances, the porous electrode structures taught by FR 2667728 are made from an inherently conductive material (e.g., porous carbons, metal carbides, gold foams), meaning that they are all capable of having sufficient electron transport to satisfactorily operate a fuel cell. Put differently, the porous electrode structures taught by FR 2667728 are in all instances "current conductors" - current conductors that are capable of collecting electrons (on the anode side) and/or discharging electrons (on the cathode side), thereby enabling a combined electrode assembly to operate satisfactorily as a fuel cell. Moreover, and as appreciated by those skilled in the art, the term "current conductor" is used interchangeably with the term "current collector"; and both terms are used to describe the inherently conductive material (not semi-conductive or insulating material) of a fuel cell that collects electrons (on the anode side) or discharges electrons (on the cathode side).

The law is clear that if a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 221 USPQ 1125 (Fed. Cir. 1984). Moreover, the mere fact that the prior art could be modified does not provide a sufficient basis for making an obviousness rejection, unless the prior art references suggested the desirability of the modification. *Id.* at 1127; *In re Spinnoble*, 160 USPQ 237, 244 (CCPA 1969) (holding that prior art references teach away from their combination if such a combination produces a seemingly inoperative device). There is no suggestion in the prior art of record for making the Examiner's proposed modifications. Moreover, and because the prior art invention being modified (*i.e.*, fuel cell of FR 2667728) would result in an inoperative device (thus unsatisfactory for its intended purpose), there can be no suggestion or motivation to make the Examiner's proposed modifications.

In view of the foregoing, Applicant respectfully requests that the Examiner's obviousness rejections of claims 1, 12-15, 18, and 19 be withdrawn.


Claims 2, 11, and 16 have been rejected under 35 U.S.C. §103(a) as obvious in view of FR 2667728 in combination with DE 19820756 as applied to claims 1, 3-10, 12-15, 18,

and 19 above, and in further view of U.S. Patent No. 5,958,616 to Salinas *et al.* Applicant respectfully disagrees and traverses these rejections.

Because claims 2, 11, and 16 all ultimately depend upon rejected independent base claims 1, 10, and 15, respectfully, and because Applicant has established the nonobviousness of claims 1, 10, and 15 for the reasons set forth above, it follows, *a fortiori* and based on identical reasoning as set forth above, that claims 2, 11, and 16 are likewise nonobvious. Accordingly, Applicant respectfully request that the above-identified obviousness rejections corresponding to claims 2, 11, and 16 be likewise withdrawn.

In view of the above remark allowance of claims 1-19 is earnestly solicited. A good faith effort has been made to place this application in condition for allowance. However, if any further matter requires attention prior to allowance, the Examiner is requested to contact the undersigned attorney at (206) 381-3100 to resolve the same.

Respectfully Submitted,


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